Notebook, PN-04-06-04

This pocket notebook was used by Edison during the period June-October 1904 for notes on experimental work to be performed. Among the experiments described are many that pertain to the chemical composition, construction, and electrical capacity of Edison's alkaline storage battery. In some cases Jonas W. Aylsworth is indicated as the proposed experimenter. Also included are several pages of rough calculations, a list of the number of employees working for various departments of the Edison Storage Battery Co., and a note about a worker at the Edison Phonograph Works. The front cover is stamped "Pass Book." The pages are unnumbered. Approximately 25 pages have been used.

RN-04-06-04

Corrugate pockets first then
fold & Crimp with very light
Corrugating pressure then will stiffen
Crimp & at same time get permanency.

Run Curves on Fe at S Lake
with various pressures to get
Variation possible

Run Fe — Hq Cy omitted Crimp
or Ha Cl and to get Crimp
and gilled —

Pocket that finish once
good but by many changes
has gone from tray washing
& drying house along
at

High chg v due to Na V-ty for
Opaloid the Cente Wax Tex

2 clean mercury side Hydrogenized
cups placed in Cupon filled with
HgO + put 24 hour KOH
with strip Cups that had oil on
spots that wouldn't burn off as gas
smoke also filled with HgO
showed specks of amalgam with clean
cups & no amalgam on the oily
cups where oil spots were —
for high discharge this would be bad

Our cells having failed to give within
16 to 18% of what they should give we thought
we would try to find trouble
following results.

1 Lack circulation — increased +	no effect
2 Green cups of normal rate	"
3 " " hydrogenized	"
4 Well washed cups of normal rate	"
5 Cups newly closed pores "	"
6 Lot phosphates — KOH	"
7 Lot HCl "	"

8 – Changing KOH 24% after each change No effect
9 " " " direct use "
10 " 5% " " "
11 " " Change "
12 Changed daily account time in 5% KOH the 24 hourly or very slowly No effect
13 Reversing cells long time then dry 24 hours "
change of very slowly "
14 Reversing Ni apart from high rate then Even temperature also
Rep Chgd Dir
15 Not allowing Ni mix to absorb H2O when
Engulfing pot Corroding No effect
16 – Taking a particular sod cell apart
changing electrodes carefully replaced 20 amp
hour solution cell that was badly
dried it but changing KOH improved bad
current = both Nickel cells were in bad
of 40 + years only inside holes, than the
Nickel – found in bad cell taken apart
that the washed was not of pure
chem –
17 made cell up of Ni plates fresh
plates being quite rough current
of 200 amp for 10 minutes in
40% KOH, swelled 10/1000 No effect
unevenly found trouble due to there not
[illegible] to Nickel & probably
dirty Calipers helped –

The Calipers of new plates showed that
had less than 4.15 cc of mix varies there is
no marque – Therefore was Rep 7c
average above 4.16 that been in minimum
average of Ni must average 3.300
Strange is possible that it was not back of
now that all the trouble was due, as was
changed our nickel fellow so it worked
Load the pockets perfectly Even –
More now + was loading of nickel pockets
provided cells 15 + 16 Rep to Nickel?
There is only one way to feel Ni pockets
Even to clean is by following ways to
fill pocket mechanically + by gravity
The scraper of a roller Hand and [illegible]
1/2" diet fixed + not replaceable
& the roller of very Cannot act as
cannot reach down by space [illegible]
Smooth face – The trip must be offset
as press get most scraper + made soft Ends
Care should be taken to keep paste the
mix of Mix at Chemical [illegible]
Causes uneven feeding by cannot
breaking of filling the pipes which
pieces of big mix

June 4 1904

Experiment on charging Ring pocket.
Stand. Ni wire w 30 min Lower than fire Compound —
1 Fe 2 Ni Lill. cell —

1 (charged) 3 hours gave 915 to Voltage 124.5
" 6 — 953
9 — 963
12 — 971
15 — 981
18 — 993
21 — 1011
24 — 1001
27 —
30 — 1033
36 — 1038

one previous 24 hours when charged 3 hours
946 —

charging used 200 m.a. for

			Ni in Pocket
3 hours	got	221	600
6 "	"	505	1200
9		710	1800
12 —		815	2400
15 —		904	3000
18 —		950	3600
21 —		978	4200
24 —		981	4800
30 —		1018	6000
36 —		1026	7200

Calgary Experiment 3.2 Ni

Dry mix not corrugated	79.6	102.3	97
" ~~corrugated~~	~~83~~	~~95~~	~~94~~
Mix 1 hour in air	78.6	92.6	98.6
" 3 " "	78	100	97

Filled pocket loose put under bell jar with sponge warm 1½ hours
~~passed~~ flat 76.7 96 95
Corrugated 83 95 94

Mix in loose pocket all night under bell jar
then Corrugated 85 91 95
84 95 97

dilute smeth dry 76 95 97
77 97 96

a hot pocket passed hot + Corrugated hot
94.8 against 90 not hot.

When we lost capacity in cells at fire clay Burr + some Volunteers + not reg gang made 12 cells both Fe + Ni plates at night + then then right through. they were fine all overnight 152 amp to start 18 plate cell — 1/2 charge after ~~[illegible]~~ about 6 charging - working some but they were bad = probably caused was Burr more evenly felled Ni pockets by doing it themself + slowly + not having Fe plates — The test was prematurely

June 4 1904

to determine if fault was due to dirty cups.

2 cells outside & inside cups plated in the strip cupped in 1½% KOH dried washed Naptha & dried ordinary washing Results OK

3 cells Outside & inside cups plated in strip, cupped in KOH 1½% dried washed Naptha & then washed very clean Results OK

3 cells Outside & inside cups plated in strip cupped – 1½% KOH dried washed Naptha dried washed very clean annealed in hydrogen Results OK

4 cells O & Y cups plated in strip cupped KOH dried washed Naptha dried ordinary washing annealed in hydrogen = Results OK

June 4 1904

6 special test cells, Outside & inside cups plated in Cup old way ——— get result.

In charging we use Na Vollage try OP KOH so if will reduce buffer and KOH & the lower charging voltage

test charging economy on Cobalt hydroxide cup charge 7c with Hg dope.

look out for hollow bottom to inside pockets make uneven loading

Look out for another of Nickel Solution on plated parts Hydrogen reduces Sulfide

June 4 1904

Odor on copper turns them darkish
A Copper held over Bunsen burner
1½ from flame color disappears
& Clips become bright smoke
Odor off
Effects are due to ~~[illegible]~~
Nitric solution a fine process
Nitro Hydrogen dioxide
& Sulphide of Nickel &
will not Bond off ~~[illegible]~~
flame but will come
off in Nitric acid

If Rust it will be red
Iron comes through
Hydrogen & Cl
off or turns red burning
reduced to Iron

June 4 1904

A good way to prove that either
the Ni or Fe is insufficient
in a Cell which fails to
give proper Amperes Cap and
to discharge to .75 Volt
then Charge ½ the cells
say Nickel against the Can
for one hour & discharge
still further & the other
½ Charge the Iron
against the Can for
same length time &
discharge further
if Lack of Iron the
Ni which has been charged
one hour will give very
little & Vice Versa with
Iron — There is some
Charging 2 hours makes
it certain

June 9 1904

33% KOH causes nickel pockets to swell very much but not the grow. The swelling is so great on the nickel that a pocket in 21% swells effec. say 10 mm from 85 in Cond. to 100 – while in 33 it sometimes swells from 85 to 140, & in some cases pulls the pockets apart at the Condr at crimp

With 6 cells having 5% KOH. the Capacity is much less & so practically used of Capacity below the freezing point

3.2 grms Ni mix in 20% has Capacity of 530 with 2 more 20% is effected Considerably below freezing point sometimes Capacity is ½ = With 33% 3.2 Ni gives as high as 750 to Volt + the Capacity is accordingly

June 9 1904

effected any below freezing but swells the pockets so unmanageable,

BaOH, in KOH of cell does not appear to harm cell —

Carbonate + oxalate only hurt cell when in great amount + then probably only by demanding the KOH

Other radicals like SO_4 NO_3 appear to act to swell the nickel by forming the Colloidal Ni hydroxide in the pores —

Uneven packing of the nickel mix in the pockets is very bad as the whole should be under pressure + the light parts get

June 9 1904

Scarcely any pressure the heavy plate on owelling raise the face of the Cup by produce between pressure on the mix —

Dirty only Cups is bad for Contact — flaked clean Cups only Cup — in KOH + filled with HgO — in 12 hours Silver Cup Current amalgamated & only Cup only annealy when Cond in oil = It would be impossible for Mix to make Contact where HgO would not amalgamate with the Cement

June 11 1904

At charge rate of .75 mil amp per pocket a 18 plate Cell at end 24 hours will show using Chg Voltage 1.78

50 per pocket		172.5
35	"	166.5
25	"	159.5
20	"	158.0
15	"	157.5
10	"	154.5

This shows that a charge per hour of 21.6 amp is forced in at end 24 hour at 1.78

14.4	"	"	172
10	"	"	166.5
7.2	"	"	159.5
5.75	"	"	158
4.3	"	"	157.5
2.8	"	"	154.5

June 11 1904

1st 2 hours

75 ma per pkt	169	2	
50 "	167	3	
35 "	164	4	
25 "	160	7	
20 "	158	4.5	
15 "	153.5	2.5	
10 "	151		

6 hours after

75	168	4
50	164	0.5
35	163.5	
25	164.5	
20	165	7.5
15	157.5	4.5
10	153	

10 hours

75	180	change
50	166	
35	163.5	
25	163.5	
20	164	4
15	160	
10	154	6

June 11 1904

18 hours

75	180
50	178
35	168
25	163
20	162.5
15	164
10	157

Have Phase Change at 10.20 & 30 ma & need V to can to see which pates gives trouble

Try letting thro Lamphlock Chalk & other precip to get foaming in letter out KOH –

To Just Redissolve to 65 Trial bottom add Hydrogene phenolphthalein Coughed Fantome and – Cotrad

Jan 13 1904

100 separations weight 130.300
made by Contin Rubber Co from
Wood 350 to 1 pound

Substances to be added to
KOH of Cell for Catalysis -
Saccharin - Phenylhydrazine
Ammonia,
Tantalic acid,
Selenic acid,
Uranyl -
~~Ag~~ Turpentine
Aniline - pyridin -
~~Ag~~ Bromic acid Bromate K
Iodic a Iodate K
Cyanic a - Cyanate K
Formic a Formate
Ferrocyanide of K -
Cyanurate K
Nitric

Jan 13 1904
with vertical slope
Iron-mix - Reduce light,
precip or use oxalates
Cadmium - Copper Cerium
Bismuth - Cobalt Nickel
Tungsten - Molybdenum,
Uranium - Vanadium Sb -
Tin - ~~Zinc~~ Silver - Chromium

Peruvanate K Evolves O at
ord temp - rapidly at 100 C -
Made by adding H_2O_2 to a
Uranic salt peruranic hydroxide
precip - by this - a battery
replace nickel

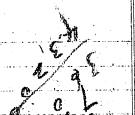
~~[illegible]~~

~~Cambric~~

precip. a little platinum with the iron (10) with the oxalate so could have Pt black on Fe of Gallery on details [illegible]

Try - phosphite K in battery list of bad developers or Hypophosphite

If there are radicals or deleterious substances in the Ni or Fe plates reverse them KOH with No sheet & quickly KOH & also change so will do reverse & change KOH in this way might get a perfect CP battery No. 7a a very good number



Try pyrochromic & pyro-[illegible] 12" dia for pumping [illegible] Collodion from [illegible]

Try 3 parts Hypo. K

~~[illegible]~~

Manganate K good test for metal oxides - precipitate when all ppt ~~[illegible]~~ Solution Colorless, to better judge the performance so don't require heat -

July 4th

Tool room	23		16 — 175		28 00
Press Room	9		55 — 125		70 00
Perforating	7		22 — 175		38 50
Pointing Room	54	night	15 — 175		26 00
Plating Room	26 = 10 —		8 — 175		5.25
Assembling Room	14		10 — 160		16,00
Testing	4	2 night	5 — 160		
Inspecting	10		2 — 240		
Stock Room	5		12 — 175		
Power plant	2	2 night	6 —		
Engraving & Ornamental		11	4		
Asst Mgr office	6		1 — 87		7
Supt office	4		2		
Shop Foreman	1		1		
Auto dept	2		1 — 200		32
Ornamental Carpenter	1				222
Machine Room	19	Cupping Mach. Drill presses & Screw Mach	3 men fd assembling 7 fd turning		
Blow Coke	48.				

Average Rate = 197 per Hour

Oct 8 1904

Mix with black mix Fe some Cadmium Hydroxy
by adding wet —
also oxide Cdg — also $Cd(OH)_2$ $SbOH_3$
— cerium —
try running Fe in small cell with
2 pts of Radical Sny Cl₂ see if
it dont clean it so it will not gas
on charging thereafter
Oxidize surface of sheet now goo
Charge + discharge Voltage with
good Rectifier
when get a good test Fe & Ni thin
Electrode — to test chg + discharge voltage
try KOH made in various ways
from K_2SO_4 — Metallic K, Ch_2H_4 aq
& other ways — also Sodium there
may be impurities that cause a
higher chg voltage & also discharge
Vs
Make some bright deposited
CP Electrolytic Iron from
3rd Iron Chloride and Sulphate
& make some oxide surface
for the electrodes by
current to get Oxalate & Chem
Red by H — see if chg voltage
better

Sloan + Chase
Iron Grievard
New Haven
Specially Dress.

~~Have filed note
foaming Cells &
see if any relation
to Capacity~~

3 4 & 8 Cap
on E18 827 E45 3
Watching

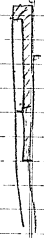
Oct 8 1904

How Hg may be impure or iron is
certainly impure & may have something
in it which has higher decomp voltage

150
160
25
25
150
90
90
20
40
185
77
52
40
115

350
45
60
43
43
60
75
75
43
310
310
60
80
80
115
115
115
115
10
20
20
40
40
33
82
2281

40 | 750



175
40
700
45
70
31 5
24
0
285
0
306
0
33
32
32
40
30
45
280
30
33
32
15
25
75
84
6

75600
74
1500
74
100 4P
7 | 500
74

20
8
2

40	52
	13
	14
	26
	12
	11
	34
	21
35 -	49
20 yrs	43
	20
Extra 15	15
	310

315
180
2520
315
5670

600.00

600000
600000
3600
6000

K Iodate, weeks GR- 35c oz 2 oz

K Hypophosphite 3 oz 149 26

K phosphite, 3 oz 49c oz

250
175
425
75
500

50
6
300

12,00 | 24
10 10
2 00

350
175
525

John A Williams
Boy 18 – 21 at Home
Bowling Green 3 yrs
four years [illegible]

24
14
96

24
336
2880

268
6
44

286

322

1656
3
4

1 9
8
64

5
1 2 0
80
2 0

1 5
4000
6000

290
600
174 0 0

125
4000
500 0 0

1 9 8 5 4 6
1 3 2 6 2 0 0 6
1 9 1
4 3 6
3 2
4 9 2 8
0 2 4